NEW DEVELOPMENTS AND BELGIAN EXPERIENCE WITH CONCRETE BLOCK PAVING IN BUILT-UP AREAS

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SUMMARY

In the seventies, a very ambitious road program was set up and carried out to make Belgium a European forerunner in the field of road construction, particularly concrete road construction.

Since the 1980's and especially during the last years, major emphasis has been laid on improving the road safety and the environmental condition in city-centres and built-up areas. Therefore more and more concrete paving blocks are used mainly for carriageways, cycle tracks and sidewalks. Otherwise the use of concrete blocks is still increasing not only for residential streets and for road surfaces in built-up areas but also for industrial applications. The progress is extraordinary: from 1 million m^2 in 1985 to 5 million m^2 in 1990.

The concrete blocks are often laid in different colours and bonds and sometimes special sizes are used. The general aim is to obtain a clear distiction between different functions of the road and more particularly to mark out carriageways, cycle traks, sidewalks, parking lanes,...

A rather new concept in Belgium consists in raising the level of crossings up to 12 cm above the normal road level. Black and white paving blocks are laid at the entries to the crossings.

For cycle tracks, there is a general tendency to use red pavements, often consisting of large concrete blocks (220 x 220 mm e.g.) or flags (300 X 150 mm).

Bright colours are usualy choosen for sidewalks and dark colours are used for parking areas.

These new developments and recent experience are illustrated by some details for typical cases.

1. Introduction

With a population of about 10 million, Belgium has over 110.000 km roads, of which 14.000 km primary roads and 1.500 km motorways. A large part of these roads has a monolithic concrete pavement, for instance 40% of the motorways and more than 60% of the rural roads. Concrete block pavements are more and more used for residential roads and sometimes for main roads in built-up areas. Furthermore they are frequently applied to industrial areas.

Due to the still increasing interest in the environment and the traffic viability the Flemish Ministry of Public Works and Transport has given during the last years priority to the re-arrangement of the main roads passing through built-up areas. For these renovation works concrete paving blocks are frequently chosen, often instead of asphalt or natural stones.

Because Belgium has more than 3.5 million cycles, there is a real need of cycle tracks for cycling safely and enjoyably in a country with nearly 3,5 million motor vehicles whereby in 20% of the accidents cyclists are involved. From the 1980's onwards, in the Flemish region the flat Northern part of Belgium a new vision appeared, in and around urban areas cycle track plans had to be drafted and implemented.

In the built-up areas these cycle tracks are often realized with red concrete paving blocks or flags.

To improve the "traffic viability" in built-up areas, about 15 pilot-projects were set up in Flanders, and Rillaar (Aarschot) is one of the first of these pilot-projects to be completed. They have been examined intensively to collect general information on traffic, parking, public transport, safety aspects, residential and planning aspects. Based on the results of the preliminary investigations, typical cross sections were put forward and surfacing materials were chosen.

2. Belgian trends in concrete block paving

For general applications and even for private use, more and more special concrete blocks with different forms, colours, and surface mixtures are used, this for aesthetic and functional reasons.

Especially for private use square setts are making progress. Ordinary rectangular grey concrete blocks 10-12 cm thick and sometimes interlocking paving blocks, mostly 10 cm thick, are increasingly used for industrial applications, especially in port areas (Antwerp, Zeebrugge and Ghent).
The growing use of paving blocks during the last 5 years in Belgium is extraordinary: from a production of 1 to 1,5 million m^2 before 1985 to more than 5 million in 1990.



Fig. 1: Situation of towns in Belgium - Flemish region.

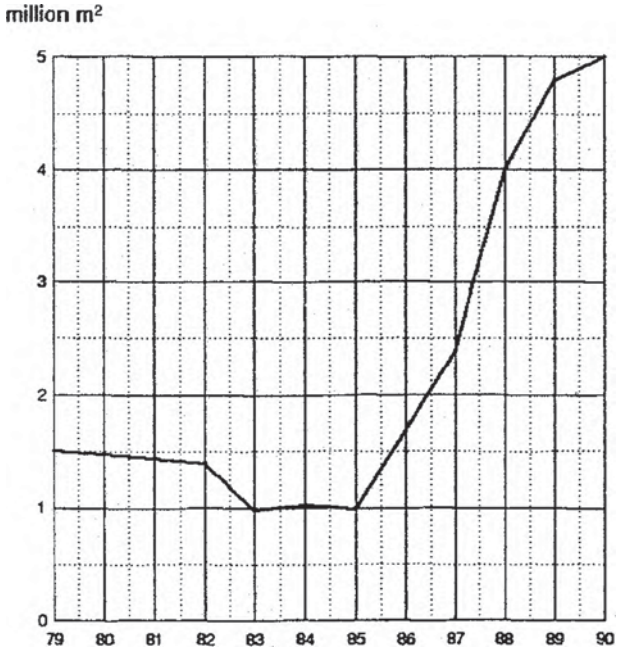


Fig. 2: Evolution of concrete paving blocks, production in Belgium.

3. New applications of concrete paving blocks in built-up areas, jand city-centres.

3.1. Pilot-project in built-up area: Traffic crossing of Rillaar (Aarschot).

The daily traffic volume of the N10 primary road in Rillaar amounted to more than 10.000 vehicles. Based on surveys, the traffic crossing Rillaar could be divided in separate zones,transitional zones between the outer area, the village centre, the zones in the village centre and the zone around the church, being the actual heart or the historical centre of the village.

In the transitional zones, the carriageway has a monolithic asphalt surface. At crossroads and in some particular spots, the carriageway is made out of grey concrete paving blocks with pedestrian crossings in white and black concrete paving blocks (Fig. 3).

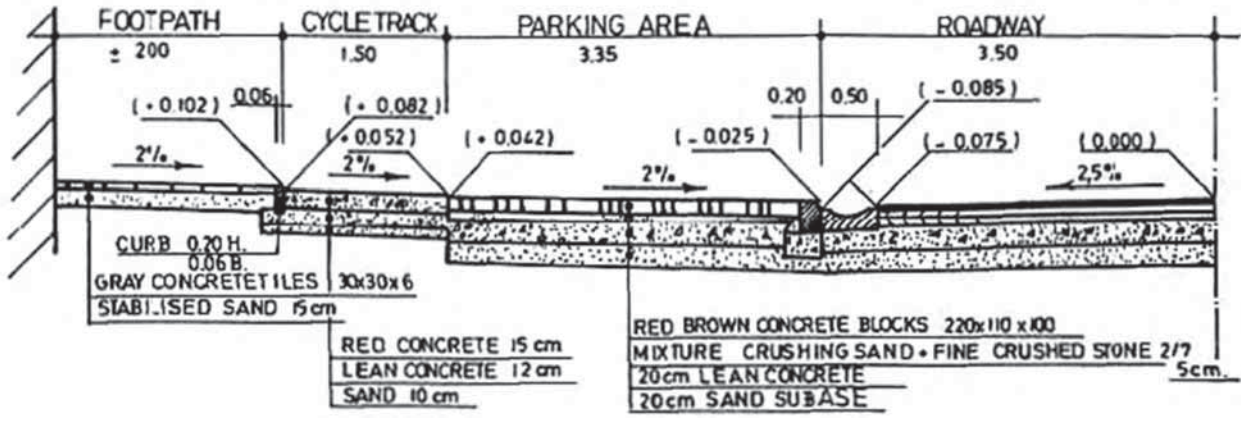


(Fig. 3)

The level of the crossings is slightly raised, thus making the pedestrian crossings more visible to the on coning traffic. Driving over this slight elevation also causes a minor shaking of the car inducing the driver to reduce his speed.

The parking lanes are laid in grey concrete paving blocks and are separated from the carriageway by a concrete gutter. The separate cycle tracks are in red concrete (Fig. 4).

Cross Section Pilot - project - renovation N10 Rillaar.



(Fig. 4)

These cycle tracks in red concrete blocks continue across the crossroads warning the turning traffic that it has to pay attention to the cyclists.

The footpath pavement consists of grey concrete flags.In the overlapping zones, the separate cycle track, first becomes an adjacent cycle track and then a cycle merging lane (invitation lane). All bicycle tracks or lanes are in red concrete. The invitation lane in red concrete paving blocks (Fig. 5).



(Fig. 5)

In the village centre the whole surfacing consists of small-scale materials (concrete paving blocks,..). The pavement was chosen in harmony with the materials used in the dominating element of the village centre, being the church (Fig. 6).



(Fig. 6)

The church was built in red-brown bricks and has vertical strips of white-beige sandstone in the outside walls.The carriageways, parking areas and footpaths are consequently laid in red-brown concrete paving blocks but in different bonds. The cycle invitation lane is laid in brown concrete paving blocks. Around the church, a resting and walking area has been provided with white-beige concrete flags.

Thickness of the concrete paving blocks:

- paving blocks used for the carriageways and cycle invitation lanes : 120 mm
- paving blocks used for the parking lanes : 100 mm
- paving blocks used for footpaths and entry paths: 80 mm.

The standard dimensions of the paving blocks are 220 mm x 110 mm.

The following bonds (patterns) are used;

- for the carriageways : herringbone bond at 45" to center line.

- for the parking lanes and cycle invitation lanes : herringbone bond.
- for the footpaths and entry paths: stretcher bond.

The layer under the paving blocks used for the carriageways and the parking areas consists of a mixture of 40 % crushed sand and 60 % crushed stone 2/7 and is 50 mm thick.

To stabilize this base course, 50 kg cement per m^3 is used. Stabilized sand is used as a base course under the footpaths.

First conclusions on traffic crossing of Rillaar.

The fact that about ten different sorts of concrete paving blocks and concrete kerbs (different in size as well as in colour) have been used clearly shows that special attention has been paid to the aesthetic and technical aspect, to the road surfacing and the road-side facilities. We may however not forget that the use of such a great diversity of concrete products complicates the execution and pushes up the costs of the works.
Similar projects are still in progress.

Experience and conclusions resulting from these works will serve as a guidance for the new lay-out of primary roads (regional roads) crossing through built-up areas and a balance will be sought between a free plan of traffic, the road safety and the traffic "viability".

3.2. New applications in city and village centres

As mentionned in the introduction, in many Belgian cities and villages a special effort was made during the last 5 years,to improve the environment and the traffic viability. The growing interest for small concrete paving products started as yet in the beginning of the 80's. Hereafter some typical new applications with some special concrete paving blocks are being reviewed.

Town centre of Aarschot

For the renovation works of the town centre of Aarschot, 3 main types of concrete paving blocks were used:

- 140 x 140 x 120 (URBA DESIGN - red/brown) for the carriageway);

- 140 x 140 x 80 (URBA DESIGN - yellow) for sidewalks;

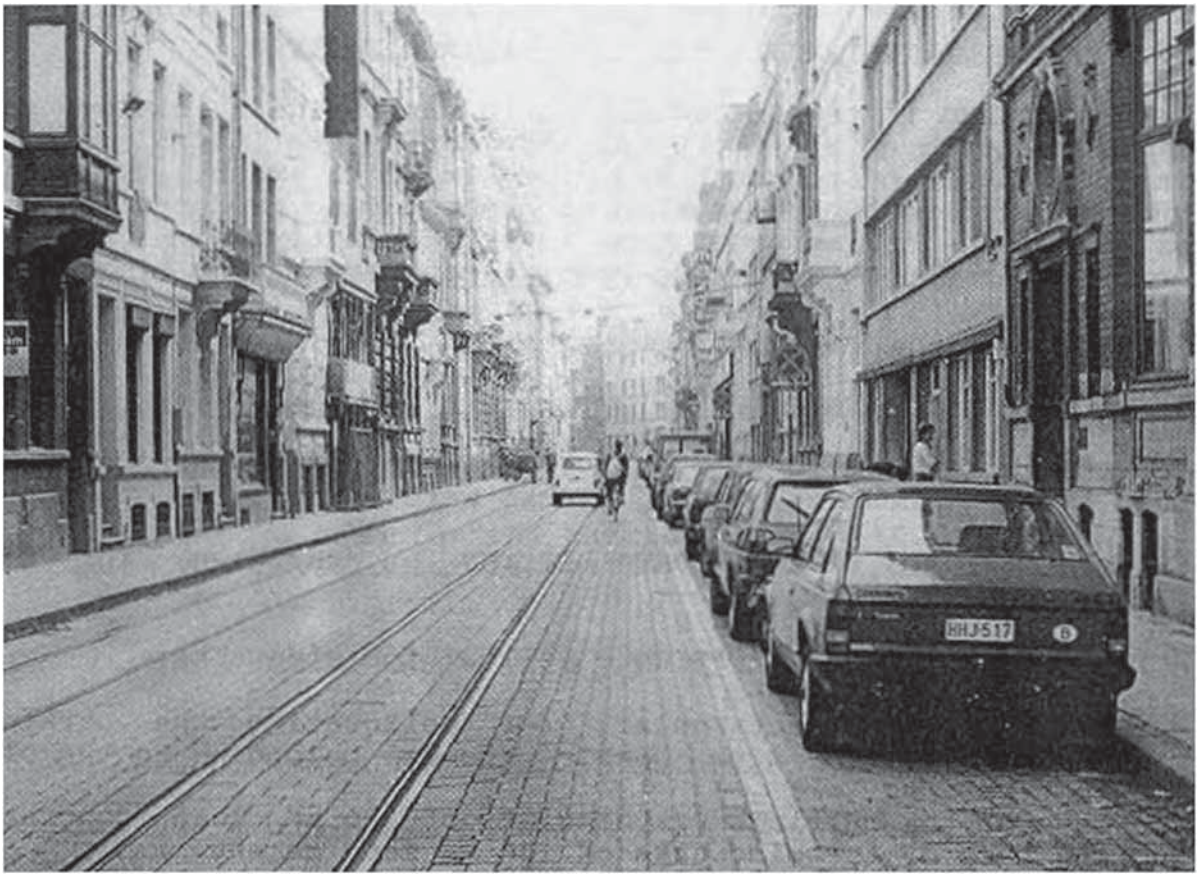
- 220 x 110 x 120 (rectangular) for delineating the parking places, realized with cobble stones belonging to the old street paving.

The base of the carriageways consists of 200 mm lean concrete and the base of the sidewalks of 150 mm sand cement.

For the bedding layer of the carriageways a mixture of 40 % crushing sand + 60 % crushed stone was used, to which 50 kg/m³ cement was added. This type of bedding layer 40 to 50 mm thick is easy to place, even during wet weather and it keeps a good stability for a long time also under heavy traffic. In Aarschot, after 3 to 5 years intensiv car traffic, the square concrete paving blocks placed on a bedding layer as explained here, show no signs of rutting or deformations.

Renovation works in the Antwerp province

The Antwerp province , in the North of Belgium, is one of the Belgian provinces with the most experience in concrete block paving. Not only in Antwerp-town but even in many cities and villages, many of streets have a concrete block pavement, mostly ordinary grey concrete paving blocks 220 x 110 x 100, placed in herringbone pattern. Because increased care for the environment during the last years, colours and mixed colours are now used. There is a trend to apply brown (red-brown) or dark grey for carriageways, bright grey or yellow for sidewalks and red for cyle tracks.
Typical for the Antwerp province is the frequent use of red blocks 220 x 220 x 80 laid in strecher bond for cycle tracks, along provincial roads and municipal roads with heavy traffic. These special blocks are also used along rails in city-streets (Fig. 7).



(Fig. 7)

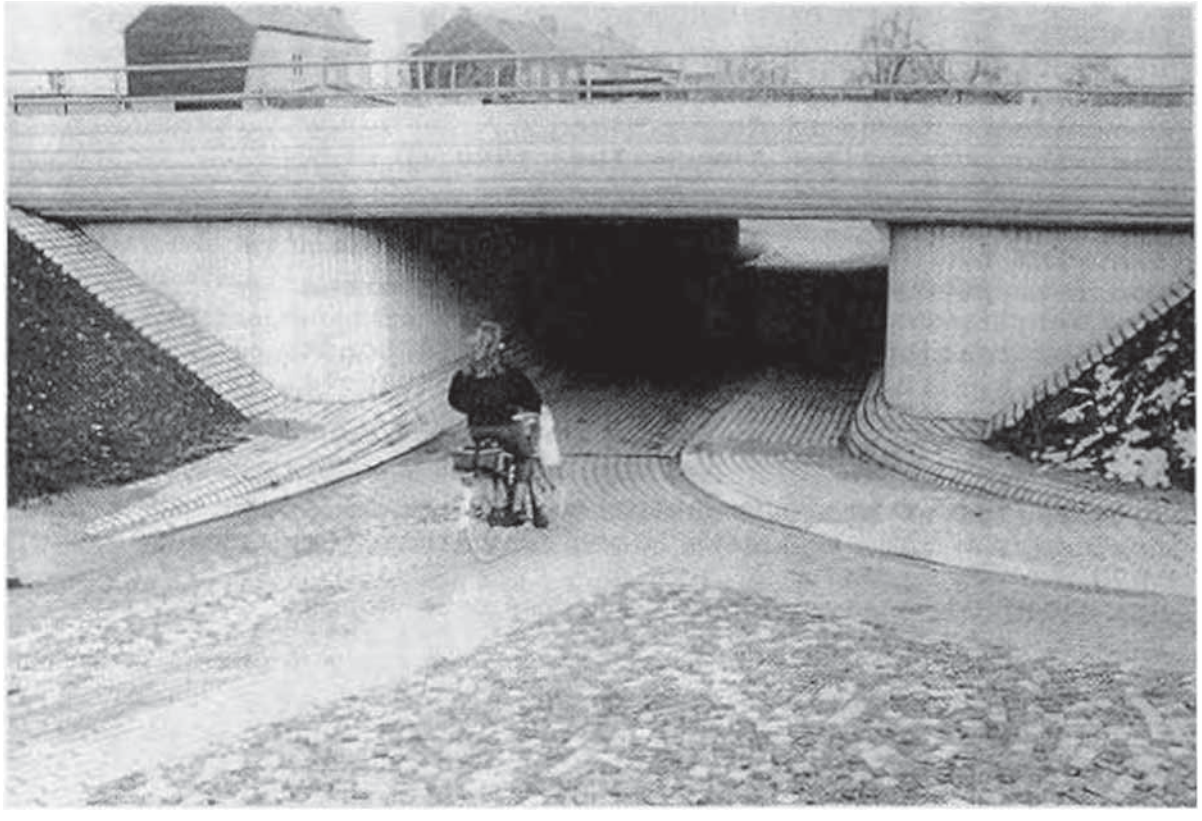
3.3 Concrete paving blocks for cycle tracks

Particularly in Flanders, the fairly flat region of the country, many cycle tracks are realized alsongside main roads to city centres.

About 2500 km of the 5000 km regional roads in Flanders have separate cycle tracks and during the 5 next years (1992-1996) more than 1.000 km new cycle tracks are planned by J. Sauwens the Flemish Minister of Public Works .

There is in and around Hasselt, the capital town of the Limburg province a model network of cycle tracks with a concrete pavement (nearly 50 km) of which a large part is made in rec concrete flags or concrete paving blocks. For the red colour 3 to 5 % pigments in respect of the cement quantity, is generally used.

Although the cycle track plan of Hasselt is separate of the main traffic artery some motorized traffic such as maintenance vehicles can use them. For resisting accidental loads and generally for preserving an even surface, without water stagnation, cement stabilized bases (120 - 200 mm) were applied under mostly 80 mm thick concrete paving blocks (interlocking blocks and normal rectangular blocks 220 x 110 mm). If the cycle tracks have many curves and round-abouts such as in the region of Hasselt, the rectangular blocks are usually placed in a stretcher pattern parallel to the cycle track (Fig. 8).



(Fig. 8)

Different concrete blocks are used for cycle tracks, in Belgium besides the normal paving blocks; more and more special products are applied such as the 220 x 220 x 80 and 300 x 150 x 80 formats, with an appearance of flags and with a little chamfer max. 2 mm so as to improve the riding quality of the cyclists.

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